<110> Wang, Huaming van Gastel, Frans Aehle, Wolfgang Rodrigues, Ana Topozada, Amr

<120> Phenol Oxidizing Enzyme Variants

<130> GC584-2

<140> US 09/656,640 <141> 2000-09/07

<1606 8

<170> FastSEO for Windows Version 4.0

<210> 1

<400> 1

<211> 1958

<212> DNA

<213> Stachybotrys chartarum

**RECEIVED** 

ggatccatca acatgatcag ccaagctatc ggagccgtgg ctctgggcct tgctgtgatc qqcqqcaqct ctgtcgatgc cagatccgtt gctggtcgat cgacagacat gccttccggt ctcaccaaqa qgcaqacqca gctgagtcct cccctggcct tgtacgaagt gcctctgccg atccctcctc tgaaggcgcc caagtagtaa gtacattcta taggctagca gagccaacgt tgctaatcat tgcagtaccg tccccaaccc caacactgga gaggacatct tgtactacga

gatggagatt aggcccttct cccaccagat ctaccctgat ctggagccgg ccaacatggt tggatacgat ggcatgtccc caggacctac catcatcgtt cctcgtggca ctgagagtgt tgtccgcttc gtgaacagcg gagagaacac ctctcccaac agcgtccact tgcacggctc tttctctcga gctccctttg atggttgggc tgaggacact acccagcctg gcgagtacaa ggattactac taccccaaca ggcaggctgc ccgcatgctt tggtaccatg accatgccat

gactgccaag cgatacaacg cagacggcac tctcttctcc accaatggag aggtttccag cttctggggt gacgttattc aagtggtaag ttgagcccat tgagatgctt cagatcctag

caggtcattg ccgctgacgg tggtctgctt gagggccctg ttgacactga cactctgtac atctctatgg ccgagcgctg ggaggttgtt atcgacttct ccaccttcgc tggccagtcc ategatatee geaacettee tggtgetgae ggteteggtg ttgageetga gtttgataae

cctttcccgt aagttctcgc cttttaccta actggttttc actcatgcta acatctacaa gtggtgtcta catgttgcac tgccacaacc tgatccacga ggaccacgac atgatggctg ctttcaatgt cactgttctc ggtgactatg gctacaacta caccgagttc attgacccca

FEB 0.4 2002

**TECH CENTER 1600/2900** 

60

1740

1800

120 180 240 300 360 420 480 540 600 gtccatcacc gccgagaacg cctacatggg tcaggctggt gtctacatga tccaggaccc 660 ggctgaggat gccctgaacc tccccagcgg ctacggcgag tttgatatcc ccttggttct 720 780 840 aagtatcgat gtatgaaatt gtgcatgctc taaccagtgc tatcacagaa cggtcagcct 900 960 tggcctatgc tcaacgtgca gccgcgcaag taccgcttcc gcttcctcaa cgctgccgtc teaegetett tegetetgta tettgetaee tetgaggatt cagagaceag aetteeette 1020 1080 1140 1200 actgacaagg tcatgcgatt cgtcgttgat gaagtccttg agtcgcccga cacttctgag 1260 1320 qtqcctqcca acctccgaga tgttcctttc cccgagggcg gcaactggga ccccgcaaac cccactgatg acgagacttt caccttcggc cgtgctaatg gacagtggac aatcaacgga 1380 gttaccttct cggatgtcga gaaccgtctg ctccgcaatg tgccccgcga cactgttgag 1440 atctggcgac ttgagaacaa ctccaacggt tggactcacc ctgttcacat tcacctcgtt 1500 gacttccgag tcctttctcg ttccactgcc cgtggagtcg agccttatga ggctgctggt 1560 ctcaaggatg ttgtctggct ggctcgtcgt gaggttgtct atgttgaggc ccactacgct 1620 1680

1860 1920 1958

1 1 1

tggagcctct ctggaggccc cgcccttcc tccteggaga gttcgagaat ggctcgggtg acttcagcga gcttgccatc actgaccgca ttcaggagat ggctagcttc aacccctacg cccaggctga tgatgatgcc gctgaggagt agaccggt

<210> 2 <211> 583 <212> PRT <213> Stachybotrys chartarum <400> 2 Met Ile Ser Gln Ala Ile Gly Ala Val Ala Leu Gly Leu Ala Val Ile Gly Gly Ser Ser Val Asp Ala Arg Ser Val Ala Gly Arg Ser Thr Asp 2.5 Met Pro Ser Gly Leu Thr Lys Arg Gln Thr Gln Leu Ser Pro Pro Leu Ala Leu Tyr Glu Val Pro Leu Pro Ile Pro Pro Leu Lys Ala Pro Asn 55 Thr Val Pro Asn Pro Asn Thr Gly Glu Asp Ile Leu Tyr Tyr Glu Met 70 Glu Ile Arg Pro Phe Ser His Gln Ile Tyr Pro Asp Leu Glu, Pro Ala 90 Asn Met Val Gly Tyr Asp Gly Met Ser Pro Gly Pro Thr Ile Ile Val 105 100 Pro Arg Gly Thr Glu Ser Val Val Arg Phe Val Asn Ser Gly Glu Asn 115 120 Thr Ser Pro Asn Ser Val His Leu His Gly Ser Phe Ser Arg Ala Pro 135 Phe Asp Gly Trp Ala Glu Asp Thr Thr Gln Pro Gly Glu Tyr Lys Asp 150 155 Tyr Tyr Tyr Pro Asn Arg Gln Ala Ala Arg Met Leu Trp Tyr His Asp . 170 His Ala Met Ser Ile Thr Ala Glu Asn Ala Tyr Met Gly Gln Ala Gly 185 Val Tyr Met Ile Gln Asp Pro Ala Glu Asp Ala Leu Asn Leu Pro Ser 200 Gly Tyr Gly Glu Phe Asp Ile Pro Leu Val Leu Thr Ala Lys Arg Tyr 215 220 Asn Ala Asp Gly Thr Leu Phe Ser Thr Asn Gly Glu Val Ser Ser Phe 230 235 Trp Gly Asp Val Ile Gln Val Asn Gly Gln Pro Trp Pro Met Leu Asn 245 250 Val Gln Pro Arg Lys Tyr Arg Phe Arg Phe Leu Asn Ala Ala Val Ser 265 Arg Ser Phe Ala Leu Tyr Leu Ala Thr Ser Glu Asp Ser Glu Thr Arg Leu Pro Phe Gln Val Ile Ala Ala Asp Gly Gly Leu Leu Glu Gly Pro 300 295 Val Asp Thr Asp Thr Leu Tyr Ile Ser Met Ala Glu Arg Trp Glu Val 310 315 Val Ile Asp Phe Ser Thr Phe Ala Gly Gln Ser Ile Asp Ile Arg Asn 325 330

Leu Pro Gly Ala Asp Gly Leu Gly Val Glu Pro Glu Phe Asp Asn Thr 340 345 350
Asp Lys Val Met Arg Phe Val Val Asp Glu Val Leu Glu Ser Pro Asp

Thr Ser Glu Val Pro Ala Asn Leu Arg Asp Val Pro Phe Pro Glu Gly

a'

```
375
    370
Gly Asn Trp Asp Pro Ala Asn Pro Thr Asp Asp Glu Thr Phe Thr Phe
                                         395
                    390
Gly Arg Ala Asn Gly Gln Trp Thr Ile Asn Gly Val Thr Phe Ser Asp
                                     410
Val Glu Asn Arg Leu Leu Arg Asn Val Pro Arg Asp Thr Val Glu Ile
                                425
            420
Trp Arg Leu Glu Asn Asn Ser Asn Gly Trp Thr His Pro Val His Ile
                            440
His Leu Val Asp Phe Arg Val Leu Ser Arg Ser Thr Ala Arg Gly Val
                        455
                                             460
Glu Pro Tyr Glu Ala Ala Gly Leu Lys Asp Val Val Trp Leu Ala Arg
                    470
                                         475
Arg Glu Val Val Tyr Val Glu Ala His Tyr Ala Pro Phe Pro Gly Val
                485
                                     490
Tyr Met Leu His Cys His Asn Leu Ile His Glu Asp His Asp Met Met
Ala Ala Phe Asn Val Thr Val Leu Gly Asp Tyr Gly Tyr Asn Tyr Thr
                                                 525
Glu Phe Ile Asp Pro Met Glu Pro Leu Trp Arg Pro Arg Pro Phe Leu
                                             540
                        535
Leu Gly Glu Phe Glu Asn Gly Ser Gly Asp Phe Ser Glu Leu Ala Ile
                    550
                                         555
Thr Asp Arg Ile Gln Glu Met Ala Ser Phe Asn Pro Tyr Ala Gln Ala
                                     570
Asp Asp Asp Ala Ala Glu Glu
            580
<210> 3
```

a's

<210> 3 <211> 2095 <212> DNA <213> Stachybotrys chartarum

## <400> 3

caqctcqqtc tactactctc gcttctcttt gacaaatcaa atctaccaat cgttccttca 60 atttcaaacq atcaacatga tcaqccaagc tatcggagcc gtggctctgg gccttgctgt 120 gateggegge agetetgteg atgecagate egttgetggt egategaeag acatgeette 180 cggtctcacc aagaggcaga cgcagctgag tcctcccctg gccttgtacg aagtgcctct 240 gccgatccct cctctgaagg cgcccaagta gtaagtacat tctataggct agcagagcca 300 acgttgctaa tcattgcagt accgtcccca accccaacac tggagaggac atcttgtact 360 acgagatgga gattaggccc ttctcccacc agatctaccc tgatctggag ccggccaaca 420 480 tggttggata cgatggcatg tccccaggac ctaccatcat cgttcctcgt ggcactgaga gtqttqtccg cttcqtgaac agcggagaga acacctctcc caacagcgtc cacttgcacg 540 gctctttctc tcgagctccc tttgatggtt gggctgagga cactacccag cctggcgagt 600 acaaqqatta ctactacccc aacaqqcaqq ctqcccgcat gctttggtac catgaccatg 660 720 ccatgtccat caccgccgag aacgcctaca tgggtcaggc tggtgtctac atgatccagg 780 accoggetga ggatgccctg aaccteecca geggetaegg egagtttgat atceecttgg 840 ttctgactgc caagcgatac aacgcagacg gcactctctt ctccaccaat ggagaggttt 900 ccagettetg gggtgaegtt atteaagtgg taagttgage ccattgagat getteagate ctagaagtat cgatgtatga aattgtgcat gctctaacca gtgctatcac agaacggtca 960 gccttggcct atgctcaacg tgcagccgcg caagtaccgc ttccgcttcc tcaacgctgc 1020 cgtctcacgc tctttcgctc tgtatcttgc tacctctgag gattcagaga ccagacttcc 1080 cttccaggtc attgccgctg acggtggtct gcttgagggc cctgttgaca ctgacactct 1140 1200 gtacatetet atggeegage getgggaggt tgttategae ttetecaeet tegetggeea 1260 gtccatcgat atccgcaacc ttcctggtgc tgacggtctc ggtgttgagc ctgagtttga taacactgac aaggtcatgc gattcgtcgt tgatgaagtc cttgagtcgc ccgacacttc 1320 tgaggtqcct qccaacctcc gagatgttcc tttccccgag ggcggcaact gggaccccgc

```
aaaccccact gatgacgaga ctttcacctt cggccgtgct aatggacagt ggacaatcaa
cqqaqttacc ttctcggatg tcgagaaccg tctgctccgc aatgtgcccc gcgacactgt
tgagatctgg cgacttgaga acaactccaa cggttggact caccctgttc acattcacct
cqttqacttc cgagtccttt ctcgttccac tgcccgtgga gtcgagcctt atgaggctgc
tggtctcaag gatgttgtct ggctggctcg tcgtgaggtt gtctatgttg aggcccacta
cgctcctttc ccgtaagttc tcgcctttta cctaactggt tttcactcat gctaacatct
acaagtggtg totacatgtt goactgocac aacctgatcc acgaggacca cgacatgatg
qctqctttca atgtcactgt tctcggtgac tatggctaca actacaccga gttcattgac
cccatggagc ctctctggag gccccgcccc ttcctcctcg gagagttcga gaatggctcg
ggtgacttca gcgagcttgc catcactgac cgcattcagg agatggctag cttcaacccc
tacqcccaqq ctqatgatga tgccgctgag gagtaaatat gatgatcgtc gaatgattta
tqqacaqcaq tatataqcta ttttaqqaaa tacttgaata agttgtggtg cttaa
<210> 4
<211> 572
<212> PRT
<213> Myrothecium verucaria
<400> 4
Met Phe Lys His Thr Leu Gly Ala Ala Ala Leu Ser Leu Leu Phe Asn
Ser Asn Ala Val Gln Ala Ser Pro Val Pro Glu Thr Ser Pro Ala Thr
Gly His Leu Phe Lys Arg Val Ala Gln Ile Ser Pro Gln Tyr Pro Met
Phe Thr Val Pro Leu Pro Ile Pro Pro Val Lys Gln Pro Arg Leu Thr
                        55
Val Thr Asn Pro Val Asn Gly Gln Glu Ile Trp Tyr Tyr Glu Val Glu
                    70
                                        75
Ile Lys Pro Phe Thr His Gln Val Tyr Pro Asp Leu Gly Ser Ala Asp
                                    90
Leu Val Gly Tyr Asp Gly Met Ser Pro Gly Pro Thr Phe Gln Val Pro
                                105
Arg Gly Val Glu Thr Val Val Arg Phe Ile Asn Asn Ala Glu Ala Pro
                                                125
                            120
Asn Ser Val His Leu His Gly Ser Phe Ser Arg Ala Ala Phe Asp Gly
                        135
Trp Ala Glu Asp Ile Thr Glu Pro Gly Ser Phe Lys Asp Tyr Tyr
                    150
                                        155
Pro Asn Arg Gln Ser Ala Arg Thr Leu Trp Tyr His Asp His Ala Met
                                    170
                165
His Ile Thr Ala Glu Asn Ala Tyr Arg Gly Gln Ala Gly Leu Tyr Met
Leu Thr Asp Pro Ala Glu Asp Ala Leu Asn Leu Pro Ser Gly Tyr Gly
                                                205
                            200
Glu Phe Asp Ile Pro Met Ile Leu Thr Ser Lys Gln Tyr Thr Ala Asn
                        215
Gly Asn Leu Val Thr Thr Asn Gly Glu Leu Asn Ser Phe Trp Gly Asp
                    230
                                        235
Val Ile His Val Asn Gly Gln Pro Trp Pro Phe Lys Asn Val Glu Pro
                                    250
Arg Lys Tyr Arg Phe Arg Phe Leu Asp Ala Ala Val Ser Arg Ser Phe
                                265
                                                    270
Gly Leu Tyr Phe Ala Asp Thr Asp Ala Ile Asp Thr Arg Leu Pro Phe
                            280
                                                285
```

Lys Val Ile Ala Ser Asp Ser Gly Leu Leu Glu His Pro Ala Asp Thr

295

1440 1500

1560

1620

1680 1740

1800

1860

1920

1980

2040 2095

290

```
Ser Leu Leu Tyr Ile Ser Met Ala Glu Arg Tyr Glu Val Val Phe Asp
                                        315
                    310
Phe Ser Asp Tyr Ala Gly Lys Thr Ile Glu Leu Arg Asn Leu Gly Gly
                                    330
Ser Ile Gly Gly Ile Gly Thr Asp Thr Asp Tyr Asp Asn Thr Asp Lys
                                345
            340
Val Met Arg Phe Val Val Ala Asp Asp Thr Thr Gln Pro Asp Thr Ser
                            360
Val Val Pro Ala Asn Leu Arg Asp Val Pro Phe Pro Ser Pro Thr Thr
                        375
                                            380
Asn Thr Pro Arg Gln Phe Arg Phe Gly Arg Thr Gly Pro Thr Trp Thr
                                        395
                    390
Ile Asn Gly Val Ala Phe Ala Asp Val Gln Asn Arg Leu Leu Ala Asn
                405
                                    410
Val Pro Val Gly Thr Val Glu Arg Trp Glu Leu Ile Asn Ala Gly Asn
                                425
Gly Trp Thr His Pro Ile His Ile His Leu Val Asp Phe Lys Val Ile
                            440
Ser Arg Thr Ser Gly Asn Asn Ala Arg Thr Val Met Pro Tyr Glu Ser
                        455
                                            460
Gly Leu Lys Asp Val Val Trp Leu Gly Arg Arg Glu Thr Val Val Val
                   470
                                        475
Glu Ala His Tyr Ala Pro Phe Pro Gly Val Tyr Met Phe His Cys His
                                   490
               485
Asn Leu Ile His Glu Asp His Asp Met Met Ala Ala Phe Asn Ala Thr
                                505
           500
Val Leu Pro Asp Tyr Gly Tyr Asn Ala Thr Val Phe Val Asp Pro Met
                            520
Glu Glu Leu Trp Gln Ala Arg Pro Tyr Glu Leu Gly Glu Phe Gln Ala
                                            540
                        535
Gln Ser Gly Gln Phe Ser Val Gln Ala Val Thr Glu Arg Ile Gln Thr
Met Ala Glu Tyr Arg Pro Tyr Ala Ala Ala Asp Glu
                565
<210> 5
<211> 21
<212> PRT
<213> Stachybotrys chartarum
<400> 5
Phe Val Asn Ser Gly Glu Asn Thr Ser Pro Asn Ser Val His Leu His
Gly Ser Phe Ser Arg
<210> 6
<211> 18
<212> PRT
<213> Stachybotrys chartarum
Gly Val Glu Pro Tyr Glu Ala Ala Gly Leu Lys Asp Val Val Trp Leu
                 5
Ala Arg
```

a'
(2)

```
<210> 7
<211> 20
<212> DNA
<213> Artificial Sequence
<220>
<223> primer
<221> misc_feature
<222> (12)...(12)
<223> n = A,T,C \text{ or } G
<400> 7
                                                                            20
gtcaacagtg gngaraayac
<210> 8
<211> 20
<212> DNA
<213> Artificial Sequence
<220>
<223> primer
<221> misc_feature
<222> (12)...(18)
<223> n = A,T,C or G
<400> 8
                                                                            20
gcggcctcat anggctcnac
```

a' Corel